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# A randomized controlled trial on the interconnected systems framework for school mental health and PBIS: Focus on proximal variables and school discipline

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ABSTRACT

This study reviews findings for the first randomized controlled trial (RCT) on the Interconnected Systems Framework (ISF) for school mental health (SMH) and Positive Behavioral Interventions and Supports (PBIS). Since its development in the late 2000s, the ISF has been supported by federally funded centers for SMH and PBIS, and, guided by a national workgroup, is being implemented in >50 communities in the United States. This experimental evaluation of the ISF involved an RCT implemented in 24 schools in two southeastern states, with the ISF implemented in eight schools, PBIS alone implemented in eight schools, and typically co-located PBIS+SMH implemented in eight schools. Related to very poor implementation, documented by two sources of fidelity data, two ISF schools were dropped from major analyses; hence, the study used a treatment on the treated (ToT; Rubin, 1974) as compared to a more traditional Intent-to-Treat approach (ITT; Lachin, 2000). This is the first paper from this large study, with emphasis here on proximal variables and school discipline. Within schools' multi-tiered systems of support (MTSS), ISF schools delivered more Tier 2 (early intervention) and Tier 3 (treatment) interventions to a greater proportion of students than the other two conditions by the second year of the intervention. There was also a dramatic difference in the provision of interventions by community mental health clinicians in ISF schools (almost half of interventions delivered) as compared to PBIS+SMH schools (around 3% of interventions delivered), underscoring the critical role of the ISF in integrating clinicians into MTSS teams and core school functions in SMH. As compared to the other two conditions, ISF schools also had reduced office discipline referrals (ODRs) and in-school suspensions, as well as reduced ODRs and out-of-school suspensions for African American students. Findings are discussed in relation to future directions of education-mental health system partnerships in improving the delivery and impact of SMH programs and services, demonstrated in the ISF.

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Early intervention to address social, emotional, behavioral, and academic (SEBA) concerns is critical to promote student wellness and prevent these challenges from worsening over time (Weeks et al., 2016). There is consensus that schools are an optimal location for promoting child and adolescent mental health and addressing emerging and more serious emotional/behavioral (EB) concerns (Weist et al., 2014). Although the full impact may not be known for some time, studies are already showing a worsening of EB concerns in children related to the COVID-19 pandemic (Patrick et al., 2020; Yard et al., 2021), so much so that both the American Academy of Child and Adolescent Psychiatry and the Children's Hospital Association declared a national emergency in child and adolescent mental health. High quality universal behavioral health promotion programming as well as more intensive and targeted interventions for small groups and individuals are available, but impacts are limited because of their ad hoc delivery and nearly exclusive focus on externalizing behaviors despite evidence that such behaviors are often comorbid with other EB concerns. Exclusionary discipline is still a common response to externalizing challenges although evidence suggests that it significantly contributes to risk for negative developmental outcomes (Skiba et al., 2014). The present study is the first experimental evaluation of the Interconnected Systems Framework (ISF), a multi-tiered intervention model intended to systematize the school mental health (SMH) service delivery system and expand school-wide prevention and intervention efforts to encompass a full range of mental health and EB concerns.

The ISF was designed to enhance the impact of Positive Behavioral Interventions and Supports (PBIS) on student outcomes by strategically integrating key features from the field of SMH within critical components of PBIS. We first identify the key features of both PBIS and SMH below and specify their impact and implementation status in schools. We then describe integration of both models in the ISF and detail the present study's research questions and hypotheses.

## 1. Positive behavioral interventions and supports

PBIS is a type of multi-tiered system of support (MTSS) for preventing and reducing aggression and other problem behavior in schools. MTSS is a broad problem-solving framework for addressing academic and behavioral needs of students by providing evidence-based practices at three levels of intensity based on collective and individual student need. MTSS and PBIS frameworks are both derived from the field of public health and prevention science, which outline a structure for the adoption and implementation of universal prevention practices (Tier 1) intended to serve all children, targeted interventions (Tier 2) for children at risk or showing early signs of problems, and intensive interventions (Tier 3) for children and youth with more significant problems (Sugai & Horner, 2006). As a school-wide strategy, PBIS improves organizational systems, such as teaming, data-based decision making, and implementation of a continuum of evidence-based intervention practices in schools. Researchers have documented a range of positive outcomes associated with PBIS implementation, including decreases in student discipline referrals (Freeman et al., 2019), decreases in suspension rates (Frey et al., 2008; Gage et al., 2019), and improvements in student academic performance and quality of life (Lee & Gage, 2020; McIntosh & Bastable, 2018), along with benefits to schools and staff such as reduction in staff turnover, improved organizational efficiency, and increased perception of teacher efficacy (Bradshaw, Buckley, & Ialongo, 2008; Bradshaw, Koth, et al., 2008; Houchens et al., 2017; Cohen, Kincaid, & Elfner Childs, 2007). A critical strength of PBIS is its emphasis on implementation support (Fixsen et al., 2005; Fixsen & Blasé, 2013), including explicit coaching and training for (a) strong communication and collaboration, team functioning, and data-based decision making; (b) clear, documented roles and responsibilities for all personnel; and (c) selecting, implementing, and refining evidence-based practices (EBPs) at each tier. Importantly, these core features build upon existing school strengths and can be adopted with high fidelity (Barrett et al., 2008; Horner et al., 2009; Kittelman et al., 2018; Mercer et al., 2017).

Well-functioning MTSS in schools (as in high fidelity PBIS) are critically needed to address the elevated needs of students and the disrupted or altered school operations precipitated by the COVID-19 pandemic. Investment in MTSS can ensure structures are in place to continuously assess student and staff functioning, monitor the effectiveness of current programs, inform the selection of new programs, and provide efficient systems of training, coaching, and ongoing support to promote optimal functioning (U.S. Department of Education, Office of Special Education and Rehabilitative Services, 2021). Well-functioning MTSS provides critical guidance on the selection and installation of new programs.

However, despite widespread adoption, PBIS effects on school behavior (e.g., office discipline referrals) have been small to moderate (Lee & Gage, 2020). Additionally, two key limitations of PBIS implementation are that (a) the majority of PBIS schools struggle with implementation of interventions at Tier 2 and Tier 3 (Hawken et al., 2009; Sugai & Horner, 2020) and (b) the emphasis is on behavior with limited attention to underlying depression, anxiety, emotional dysregulation, and trauma (McIntosh et al., 2014; Weist et al., 2018). In a recent summary of the past 20 years of federally-supported PBIS implementation and sustainability, Sugai and Horner (2020) found about 25% more schools evaluate implementation fidelity of Tier 1 than of Tiers 2 or 3. Although 65% of schools evaluating Tier 1 implementation reach established cutoffs, only 33% and 18% reach implementation criteria at Tiers 2 and 3, respectively.

## 2. School mental health

In addition to the growing implementation of PBIS, there has been increasing national movement toward expanding school-based mental health promotion, prevention, and intervention practices with collaboration from community-based mental health providers in schools, augmenting the work of school-employed mental health staff (e.g., school psychologists, school social workers, school counselors). The need to expand the capacity of school employed mental health staff is evident. For example, although school psychologists possess the skills to provide mental health services, they currently spend <25% of their time providing them, spending up to

80% of their time on special education assessment, reporting, and meetings (Hanchon & Fernald, 2013; Suldo et al., 2010). The development and growth of this movement has been facilitated by a number of state and federal investments, primarily from the Health Resources and Services Administration (HRSA) and the Substance Abuse and Mental Health Services Administration (SAMSHA), and a national center, the University of Maryland Center for School Mental Health (CSMH, see www.schoolmentalhealth.org) that has been federally-funded since the mid 1990s.

In this model, schools are positioned as an ideal venue for mental health service delivery and research supports this with evidence of significantly improved access to care and early identification and intervention in school-based settings (Atkins et al., 2006; Catron et al., 1998), and thus improved student outcomes (Hoagwood & Erwin, 1997). Examples of positive student outcomes include reduction of emotional and behavioral problems, reduction of disciplinary referrals, and increased prosocial behaviors (Stephan et al., 2007), as well as improved academic functioning, such as improved attendance and grade point averages (Walker et al., 2010). To meet this growing opportunity and recognition of need, evidence-based practices for a continuum of mental health needs have proliferated, including school-wide curricula for promotion and prevention, as well as early intervention and treatment practices (Fazel et al., 2014). For example, clinicians may be trained to deliver interventions such as Cognitive Behavior Intervention for Trauma in Schools (CBITS; Jaycox et al., 2012) or Coping Cat (O'Neil et al., 2012), an evidence-based intervention for youth with anxiety. Thus, mechanisms for improved outcomes for SMH as compared to clinic-based care include more rapid identification of students in need (Splett et al., 2018), increased likelihood of service receipt (as above), delivery of care in a more natural ecological setting (Atkins et al., 2006), and feasibility of implementing established evidence-based practices in the school environment.

Yet, this model of SMH commonly involves "co-located" clinicians implementing these Tier 3 treatment programs in a manner isolated from other programming in schools, including PBIS (Barrett et al., 2013; Weist et al., 2014) and/or school-wide curricula, such as social emotional learning programming (Kern et al., 2021; Villarreal, 2018). Under this model of stand-alone SMH, school-based staff from community-based mental health centers often operate in isolation (Bronstein, 2003; Mellin & Weist, 2011). Students may need to present more severe problems before they are referred for these mental health supports, resulting in more intensive, costly services that are less likely to achieve valued outcomes (Splett et al., 2018). The reactive and isolated nature of these services limit their impact on the school system and student outcomes.

## 3. Interconnected systems framework for SMH and PBIS

The Interconnected Systems Framework (ISF) addresses limitations of PBIS and SMH by providing specific guidance on the systematic interconnection of SMH clinicians and programming with PBIS systems, data, and practices. This guidance was first articulated in a widely distributed e-book (Barrett et al., 2013) and more recently expanded upon in an additional e-book emphasizing strategies, tools, and resources for implementation (Eber et al., 2020). In the ISF, school team membership is expanded to ensure school administrator input, and PBIS and SMH experts are active and present team members (also see Splett et al., 2017). Data systems are expanded to include universal mental health screening to identify students in need of additional intervention services at Tiers 2 or 3 (also see Romer et al., 2020) and inform expansion of evidence-based practice programming at all tiers, including a wider range of mental health programming than traditional PBIS implementation.

The ISF represents a strong cross-system partnership between the education and mental health systems providing advantages to each system, such as greater depth and quality of programming for education, and increased connection to students and families in a more natural environment for mental health (Barrett et al., 2013). Ideally, ISF implementation emphasizes effective partnerships that are vertical (e.g., district to school building) and horizontal (e.g., a broad and inclusive interdisciplinary team guiding the work within a school). At the district level, a District-Community Leadership Team (DCLT) that includes leaders, staff, and stakeholders from education, mental health, other youth serving systems (e.g., child welfare, juvenile justice, primary care), families, and older youth guides the work occurring in school buildings and ensures true collaborative relations between education and mental health staff through memoranda of agreement (MOAs; Barrett et al., 2013). At the building level, MTSS teams include clinicians from the mental health system who are active team members involved in core functions across all tiers, such as data-based decision making, delivery and refinement of evidence-based practices, coaching, layering of programs across tiers, fidelity and progress monitoring, and evaluation of student outcomes (Eber et al., 2020). Commonly in ISF, clinicians focus more time on Tier 3 services, while being engaged in the full MTSS as just described; they also coordinate with school psychologists and other school-employed mental health staff (e.g., clinicians provide Tier 3 intervention to students in general education, whereas school psychologists provide these interventions to students in special education).

## 4. Present study

The present study represented a 4-year randomized controlled trial (RCT) funded by the National Institute of Justice (NIJ) as part of its Comprehensive School Safety Initiative (# 2015-CK-BX-0018, 2016–2020). The study operated in 24 elementary schools in two southeastern school districts with 12 schools participating from each district. Candidate schools were selected from each district based on district reports that these schools were implementing PBIS with reasonably strong fidelity. Within each district, four schools each were randomly assigned to (a) PBIS only, (b) PBIS+SMH (where schools had mental health clinicians assigned to them with no guidance on how to integrate these staff), or (c) ISF. The intervention vs. comparison condition in the study operated in academic years 2016–2017 and 2017–2018. These three conditions were chosen based on hypothesized incremental benefits of the ISF over the other two conditions, but we acknowledge that related to funding constraints, this led to a relatively small number of schools in each condition ($n = 8$). The IRB-approved study operated with an opt-out strategy related to its minimal risk and focus on improving

educational systems. This resulted in a very large amount of data collected, including academic record data for >31,000 students. We collected data from all schools on proximal variables hypothesized to influence outcome variables of MTSS and team functioning, receipt of services by students in need, and interventions received by students in need. There were a range of outcomes assessed, including (a) student discipline, (b) student social-emotional-behavioral functioning, (c) school climate, and (d) student academic functioning. Given the size of the study and the magnitude of data collected, four papers are being prepared to reflect these four domains. This first paper focuses on proximal variables mentioned above and discipline related outcomes associated with the primary aims of the NIJ Comprehensive School Safety Initiative.

### 4.1. Proximal outcomes and hypotheses

First, we tested effects on hypothesized proximal outcomes. Teaming is a common practice in school settings and drives PBIS implementation at Tier 1. When done well, teaming produces strong, positive effects on student behavior and progress toward intervention goals (Burns & Symington, 2002; Horner et al., 2018). But teams often fall short of best practices, such as by meeting sporadically or at low frequencies with vague agendas and poor follow-up on decisions, with limited administrator and organizational support to remedy the situation (Rosenfield et al., 2018). Coaching models focusing on data-based decision making (e.g., the Team Initiated Problem Solving [TIPS] framework; Horner et al., 2018) and teaming practices that reinforce members' roles and responsibilities, such as organizing data before meetings and setting clear agendas, have been shown to improve team functioning (Bastable et al., 2019). Additionally, team composition, administration input, and organizational support are important factors known to be associated with effective team functioning (Iachini et al., 2013; Rosenfield et al., 2018). ISF involves expanding team membership to be inclusive of school administrators, staff with PBIS expertise, and SMH clinicians, along with training and coaching on interdisciplinary teaming practices (e.g., Rosenfield et al., 2018; Splett et al., 2017) and data-based decision making. Thus, we expected that ISF would lead to the proximal outcome of enhanced team functioning as indicated by increases in (a) administrator input (e.g., consistent attendance from school administrators and other key decision-makers), (b) organizational support that protects time for and prioritizes team meeting (e.g., frequency and length of team meetings), and (c) diversified team member composition (e.g., more consistent attendance of professionals with mental health expertise, such as school psychologists and community mental health providers).

Second, ISF involves expanding Tier 1 data-based decision-making to include teacher-reported universal mental health screening data, collected school-wide twice yearly, paired with training and access to Tier 1 SMH programming. Thus, we expected ISF would increase school teams' promotion of Tier 1 mental health prevention strategies. Finally, we predicted that conducting teacher-reported universal mental health screening twice yearly to identify students with unmet mental health needs and developing protocols for school teams to follow in implementing screening and connecting identified students to needed Tiers 2/3 SMH services would lead to more students with mental health difficulties accessing these services.

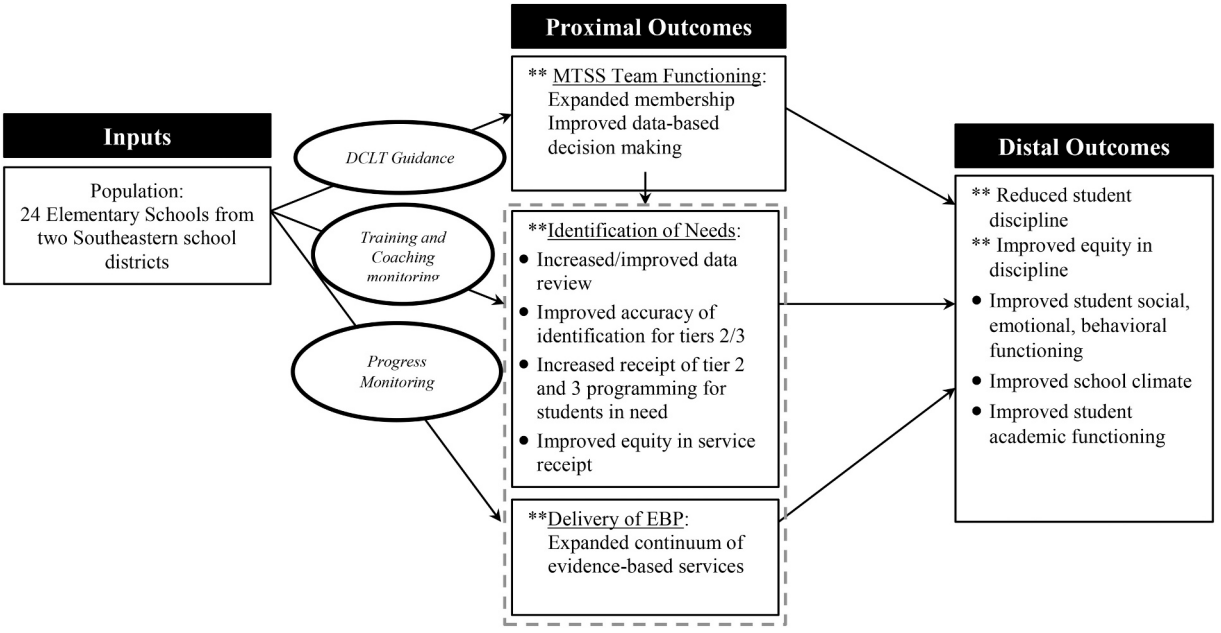


**Fig. 1.** Interconnected systems framework, theory of change.
*Note.* This figure shows our Theory of Change, including inputs, proximal outcomes, and distal outcomes. DCLT = District Community Leadership Team; EBP = Evidence-Based Practices; MTSS = Multi-Tiered System of Supports. Also note that outcomes focused on in this article are indicated by asterisks (**).

### 4.2. Distal outcomes and hypotheses

Importantly, we also hypothesized impact on student outcomes, specifically improving student behavior above and beyond that already achieved by PBIS and co-located, but traditionally disconnected, PBIS and SMH. As educators and school teams talk about students' mental health needs from prevention and intervention lenses, their awareness of such concerns rises. We hypothesized this would further reduce disciplinary actions beyond that already achieved by PBIS' more narrow behavioral approach to Tier 1 and SMH's disconnected approach to Tiers 2 and 3. We hypothesized the ISF's effect on disciplinary actions would be more pronounced for students most at risk for such punitive actions. Previous research has demonstrated that PBIS' impact on disciplinary outcomes varies by students' level of risk prior to PBIS implementation (Bradshaw et al., 2015). The odds of African American students experiencing an office discipline referral is twice that of their same age White peers in elementary school and four times that in middle school (Skiba et al., 2011). Disciplinary removals from school place students at risk for the school to prison pipeline (Wald & Losen, 2003). We hypothesized that ISF would reduce disciplinary actions more for African American students than White students given this well-established disparity in risk level. If detected, this effect would offer a means by which schools can leverage ISF to change inequitable systems and outcomes in their service delivery setting.

These proximal and distal hypotheses together are illustrated in a theory of change (TOC) presented in Fig. 1. First, we predicted that ISF schools would have better functioning teams than comparison schools, as evidenced by greater inclusion of mental health professionals and improved data-based decision making. These changes will emerge as a function of fidelity to teaming principles, family engagement, and training. Second, we predicted that ISF schools would demonstrate relative improvements in student screening and identification, as evidenced by frequent data review, increased receipt of Tier 2 and 3 programming for students in need, and improved equity in service receipt. These changes will emerge as a function of high-quality progress monitoring and training. Finally, we predicted that ISF schools would experience better delivery of EBPs, as evidenced by an expanded continuum of practices. These proximal outcomes would then lead to several distal outcomes, including (a) reductions in student discipline;* (b) improved equity in discipline;* (c) improved student social, emotional, and behavioral functioning; (d) improved school climate; and (e) improvements in student academic functioning (with emphasis of this paper on reductions in student discipline and improved equity in discipline as indicated by *).

Regarding equity, African American children are increasingly less likely than their White counterparts to receive needed mental health services (Rodgers et al., 2022). As such, the mental health needs underlying behavior problems are more likely to go unaddressed for African American students than for White students. By attenuating the racial gap in connection to mental health care services through seamless, integrated mental health service delivery, ISF would be expected to reduce the disparities in behavior problems that result in disciplinary referral.

Compounding evidence confirms that achieving the outcomes hypothesized here most likely depends on the implementation quality of ISF within schools randomized to the intervention condition. Implementation quality is consistently found to influence

**Table 1**
Demographics by year and condition.

| Year | Condition | Total Enrollment | % White | % African American | % Hispanic | % Male | % SPED |
|---|---|---|---|---|---|---|---|
| 2013–2014 | | | | | | | |
| | PBIS only | 3954 | 49.8 | 33.0 | 10.9 | 51.9 | 6.4 |
| | PBIS+SMH | 4546 | 43.2 | 41.8 | 8.1 | 51.0 | 6.6 |
| | ISF | 5063 | 58.5 | 23.4 | 10.3 | 52.1 | 6.7 |
| 2014–2015 | | | | | | | |
| | PBIS only | 3939 | 50.5 | 31.8 | 11.4 | 51.6 | 12.7 |
| | PBIS+SMH | 4900 | 42.3 | 42.2 | 8.4 | 51.6 | 11.1 |
| | ISF | 5123 | 58.8 | 22.8 | 10.8 | 51.2 | 14.8 |
| 2015–2016 | | | | | | | |
| | PBIS only | 3806 | 49.7 | 32.2 | 11.6 | 51.4 | 16.3 |
| | PBIS+SMH | 5067 | 42.6 | 41.8 | 7.9 | 50.4 | 14.3 |
| | ISF | 5127 | 57.7 | 22.8 | 11.7 | 51.5 | 19.2 |
| 2016–2017 | | | | | | | |
| | PBIS only | 3931 | 48.2 | 32.7 | 12.8 | 51.2 | 16.4 |
| | PBIS+SMH | 5241 | 41.7 | 42.3 | 8.2 | 49.1 | 15.5 |
| | ISF | 5335 | 58.1 | 22.4 | 11.7 | 50.5 | 18.9 |
| 2017–2018 | | | | | | | |
| | PBIS only | 3647 | 46.4 | 34.5 | 13.1 | 52.5 | 14.7 |
| | PBIS+SMH | 4784 | 41.5 | 41.6 | 8.8 | 50.5 | 14.2 |
| | ISF | 4753 | 58.6 | 22.1 | 11.6 | 51.4 | 15.6 |

*Note.* PBIS = Positive Behavioral Interventions and Supports; SMH = School Mental Health; ISF = Interconnected Systems Framework; SPED = Special Education Status.

outcomes across a diverse set of programs, providers, and settings in educational and mental health research (Durlak & DuPre, 2008). In fact, the mean effect size of programs implemented with quality are two to three times higher than those with less desirable levels of implementation (Derzon et al., 2005). Elementary schools that implement PBIS with high fidelity are also significantly more likely to have lower disciplinary problems and higher test scores in reading and math (Pas et al., 2019). Thus, it is also important to consider implementation quality in testing effects of the ISF.

The ISF-Implementation Inventory (ISF-II) is a nationally validated measure to assess implementation quality of the ISF at each implementation tier across seven practice domains (e.g., Teaming; Intervention selection, implementation, and progress) within a school building (Splett, Perales, et al., 2020). It is used by nearly 20 school districts across 10 states to regularly assess implementation fidelity of the ISF in participating schools and use results for action planning and continuous improvement. As described in the following section, schools implementing ISF in the present study also used the ISF-II twice yearly to measure, monitor, and continuously improve the quality of their implementation efforts.

## 5. Method

### 5.1. Participants

As noted above, 24 elementary schools implementing PBIS from two southeastern school districts (12 schools per district) participated. Prior to the first year of implementation, average student enrollment was 583.3 students per school. Most students were White (50.1%), followed by African American (32.2%) and Hispanic (10.3%) students. Approximately 16.6% of students received special education services. Table 1 provides demographics by treatment condition by year. There were more students in the ISF schools than the PBIS only and PBIS+SMH schools. There were more white students and students receiving special education services in ISF schools and more African American students in the PBIS+SMH schools.

### 5.2. Procedures

#### 5.2.1. Recruitment and randomization

Elementary schools in the participating school districts were recruited if they met the following criteria: (a) served students kindergarten through fifth grade, (b) implemented PBIS with fidelity the previous school year, and (c) did not have SMH presence prior to the study, defined as the presence of community-employed mental health providers in the school building. School district leaders collaborated with research staff to recruit participating schools; university and school district Institutional Review Board procedures were followed for data collection.

We assigned schools within each of the two states to the three conditions using randomized block assignment. First, we ranked schools based on the percentage of students eligible for free and reduced lunch and also rated every school (three categories) on PBIS implementation as measured by the Tiered Fidelity Inventory (TFI; Algozzine et al., 2019) or Benchmarks of Quality (BoQ; Childs et al., 2011). We then formed blocks of three schools per block such that (a) school free-and-reduced lunch rankings within a block were within four ranks of every other school in the same block and (b) PBIS ratings were in the same category, or an adjacent category when the same category was not possible. This resulted in within block homogeneity and across block heterogeneity, with respect to the two blocking variables. We then used a random number generator to randomly assign schools to the three conditions (PBIS Only, PBIS+SMH, or ISF) within each block. Following randomization, the intervention phase was implemented for two consecutive school years. Each condition is briefly described below.

PBIS Only. During the 2-year intervention phase, the eight PBIS-only schools continued to implement PBIS as directed and supported by their school district (i.e., “business as usual”). No additional training or grant-funded resources were provided to these eight PBIS study schools.

PBIS + SMH. In the eight PBIS+SMH schools, grant funds paid for licensed master’s level mental health clinicians with at least 3 years’ experience from collaborating community mental health centers to work in each PBIS+SMH school for 2.5 days per week. In this active control condition, these clinicians entered into and operated in the schools with no particular guidance beyond that which already occurred within the district. No specific services were recommended by the grant, nor were any strategies recommended for teaming with the community mental health clinicians or using any data or procedures beyond those traditionally implemented to identify students at risk (e.g., discipline referrals, teacher/parent/self-referrals). Like the PBIS only schools, these PBIS+SMH schools continued to implement PBIS as directed and supported by their school district.

Interconnected Systems Framework. For the eight ISF schools that were participating, grant funds were also allocated to hire mental health clinicians with the same qualifications (master’s degree, licensure, and at least 3 years’ experience) from collaborating community mental health centers to work in each ISF school for 2.5 days per week. However, in this intervention condition, clinicians joined with the school’s PBIS efforts to implement the ISF, following manualized guidance (Barrett et al., 2013; Eber et al., 2020). We describe key elements of the ISF of teaming, professional development and coaching, universal screening, and District-Community Leadership Team below.

*Teaming.* School-level teams led ISF implementation using best practice guidelines for implementing multi-tiered frameworks in schools (Horner et al., 2018; Rosenfield et al., 2018; Splett et al., 2017). ISF schools expanded membership of their existing PBIS team to encourage participation with the following professionals (as applicable): school administrator, community employed SMH clinician, school counselor, family member representatives, a general education and special education teacher, and other support staff such as school psychologist or school social worker. Professional development, coaching, and technical assistance were provided after baseline

data collection to the expanded teams (herein called ISF teams) via a (a) cross-site implementation leader with expertise and national leadership in ISF implementation and dissemination, (b) full-time district-employed ISF coach in each participating school district, and (c) 1-day per week ISF clinical supervisor employed by each participating community mental health center.

*Professional Development and Coaching.* On-site, in-service professional development on the ISF was led by the cross-site implementation leader for 1.5 days at the start of the intervention period, 1 day at the end of Year 1, and 1.5 days at the beginning of Year 2. Virtual professional development was provided to school and community-employed mental health professionals monthly in Year 1 and quarterly in Year 2 regarding the changing role of clinicians, expanding team membership and team functioning, authentic family engagement, how to use data for decision making, and delivering individual and small group counseling using evidence-based, modularized intervention strategies for anxiety, depression, trauma, and conduct problems (Chorpita & Weisz, 2009). The cross-site implementation leader also facilitated weekly consultation with site-specific, grant-supported ISF district coaches and community mental health clinician supervisors. The ISF coaches and ISF mental health clinician supervisors supported the building level teams and were part of the District and Community Leadership Teams (DCLT). They assisted in the collaborative planning and development of cross training. At the building level, district ISF coaches and ISF clinical supervisors gave an overview of ISF to all faculty and staff, describing how it addresses behavioral health and wellness, as well as mental health awareness. At the advanced tiers, ISF Coaches and Clinical Supervisors ensured that community and school employed staff who were responsible for implementing interventions received appropriate professional development and technical assistance/supervision regarding each intervention. ISF coaches met regularly with school teams to guide continuous implementation and progress monitoring activities.

*Universal Mental Health Screening.* Universal mental health screening was conducted twice annually (October and February) in all ISF schools via the Behavioral Assessment System for Children-Third Edition, Behavioral and Emotional Screening System – Teacher Form (BASC-3 BESS Teacher; Reynolds & Kamphaus, 2015). The BASC-3 BESS Teacher is a 20-item instrument adapted from the BASC-3 Teacher Rating Scale to measure behavioral and emotional strengths and weaknesses of students in kindergarten through 12th grade. The teacher form of the BASC-3-BESS provides an overall Behavioral and Emotional Risk Index T-Score, as well as three subindex raw scores (i.e., Externalizing, Internalizing, and Adaptive Risk Indices). Risk cutoffs for all four scores were established by the developers (Reynolds & Kamphaus, 2015) and used by ISF teams in the Project About School Safety (PASS, study name for schools, community members) to identify students in need of Tier 2 or 3 intervention services, along with other data sources (e.g., attendance, discipline records, student report and interview). BASC-3 BESS Teacher scores were also used by ISF teams to inform evidence-based practice programming across all three tiers and at multiple aggregated levels (e.g., need for social skill training in Grade 4, or anxiety coping strategy in Grade 3). The developers documented adequate psychometric properties in the standardization sample (Reynolds & Kamphaus, 2015) and the study team reported high internal consistency of scores from the entire scale ($\alpha = 0.94$), the 6 items of the Externalizing factor ($\alpha = 0.95$), the 6 items of the Internalizing factor ($\alpha = 0.89$), and the 8 items of the Adaptive factor ($\alpha = 0.93$) in prior publications (Splett, Raborn, et al., 2020).

*District and Community Leadership Team.* In addition to the efforts within the schools, a subset of key stakeholders (e.g., district coaches, mental health agency supervisors, school administrators, district liaisons) met quarterly to discuss progress within the schools in the ISF condition and problem solve any challenges. The goal of this group was to form a District and Community Leadership Team (DCLT, reviewed earlier) that would build capacity and a plan for sustainability at the conclusion of the research study. Activities of the DCLT included reviewing aggregate implementation data, resolving challenges such as addressing confidentiality and ongoing funding of mental health supports, and addressing staff turnover (see Eber et al., 2020, and Splett et al., 2017).

#### 5.2.2. Data collection

All student-level data for the current study were collected from school records and de-identified with unique project ID numbers following protocols approved by each site's Institutional Review Board. Data collection was supported by a grant-funded, district-employed program evaluation specialist at each site who was responsible for collecting, de-identifying, tracking, and sharing study data with the research team. The program evaluation specialist and grant-funded, district-employed coach trained each study school on data collection procedures and measures (e.g., team meeting and intervention receipt forms described next) at the beginning of each Year 1 and again at the beginning of Year 2 due to turnover in school administration and team membership. Proximal outcome measures were collected from school records monthly and distal outcome measures were collected at the end of each school year. Distal outcome data were available for 3 years prior to study implementation through the end of the 2 years of the study, and proximal measures were available for only the 2 years of study implementation.

### 5.3. Measures

#### 5.3.1. Proximal variables

All school teams were instructed to complete a Team Meeting Form during each school team meeting. This form was developed for the study and included the following fields: meeting duration (minutes), tiers of support discussed, roles of team meeting participants, and how long (minutes) each participant was present in the meeting. Team Meeting Form data were collected monthly by each district's grant-funded program evaluation specialist from all study schools. Teams who did not meet during the month were instructed to turn in a form indicating such (i.e., 0 min in the meeting duration field). The forms were scanned and saved as hard and electronic copies and the data were entered into an electronic database. Meeting frequency and duration, as well as school administration and SMH clinicians' attendance rates, were used as indicators of team functioning. Teams' coding of Tier 1 agenda items was used as an indicator of Tier 1 planning and programming. Upon review of Team Meeting Form raw data, we found that some schools provided multiple team meeting forms when a staff member left or joined the meeting or when describing different grade-levels. Therefore, we

collapsed data from multiple forms on the same date into a single meeting and counted the total number of times each school team met.

Anyone delivering a behavioral or mental health intervention in the school was asked to complete the Intervention Receipt Form (IRF) at the end of each month. The IRF was also developed for this study and includes the type of intervention received, as well as the frequency and duration of intervention delivery for every student receiving social, emotional, or behavioral intervention in the school. The grant-funded district-level program evaluation specialist worked with school administrators to identify all school behavioral and mental health providers in the school building at the beginning of the school year and then emailed a request to complete the IRF to each identified provider at the end of every month. Providers who did not deliver any behavioral or mental health interventions during the month were instructed to return a form indicating such (e.g., 0 for frequency and duration fields). The program evaluation specialist replaced all student names on the IRFs with the unique project ID to provide de-identified data to research staff. Students with ID numbers listed on any IRF during the study's two-year period were coded as receiving intervention services.

#### 5.3.2. Primary outcome variables

De-identified school records were provided by both school districts on all students in Grades K–5 of study schools for 3 years prior to implementation, as well as each year of the study. Discipline data (i.e., office disciplinary referrals and in- and out-of-school suspensions), attendance, and academic data were provided (with attendance and academic data the focus of another article). We created dichotomous indicators for office disciplinary referrals (ODR), in-school-suspensions (ISS), and out-of-school suspensions (OSS) to examine the likelihood a student received a disciplinary encounter by treatment condition.

#### 5.3.3. Moderating demographic variables

We used de-identified school records to identify student demographic characteristics, which were then used as covariates in the analyses. Student-level covariates included grade-level, gender, race/ethnicity, and special education status, and school-level covariates included the state where the school was located, total school enrollment, percentage of male students, percentage of students receiving special education, and percentage of African American, Hispanic, and White students.

#### 5.3.4. Implementation fidelity

We used the ISF-Implementation Inventory (ISF-II; Splett, Perales, et al., 2020) to assess the extent to which the key features of ISF were implemented at the school level in ISF study schools. The fidelity assessment was completed by members of the ISF team at each school with the support of the district-level ISF coach in about 30 min and results were used to support action planning and continuous improvement at the school and district levels.

The ISF-II includes 54 items distributed across three tiers in the domains of (a) implementation of school-wide PBIS; (b) teaming; (c) collaborative planning and training; (d) family and youth engagement; (e) intervention selection, implementation, and progress; and (f) school-wide data-based decision making. With the trained coach, team members rated each item on a 3-point scale from *not yet implemented* (0) to *partially* (1) and (2) *fully implemented* using a rubric that operationally defined each rating option for each item. A total score across tiers and domains was generated along with a percentage of total points possible. A percentage of 80% or higher for each tier is considered adequate implementation, consistent with recommendations and recent criterion testing for other PBIS fidelity assessment tools (Mercer et al., 2017; Pas et al., 2019). The validity, reliability, and usability of the ISF-II have been documented in a national validation study where the tool's three-tier structure was supported by two-level factor analyses accounting for school-level and timepoint nesting, and scores within each tier and domain were found to be internally consistent ($\omega = 0.90$–$0.95$; Splett, Perales, et al., 2020).

We also collected PBIS implementation fidelity data from each school. Consistent with widely accepted PBIS research and evaluation practices, schools completed two different measures with the guidance of an external, district-employed coach independent of the grant-funded study to measure and monitor their implementation of PBIS, including the TFI (Algozzine et al., 2019) and the BoQ (Cohen et al., 2007). The TFI is a 45-item fidelity tool structured around three subscales: Tier 1 implementation, Tier 2 implementation, and Tier 3 implementation. Each subscale score and total score are summed and divided by the total points possible. The developers define adequate implementation fidelity as 70% of possible points overall and by subscale. McIntosh et al. (2017) conducted an initial psychometric evaluation of the TFI from a diverse sample of 789 schools across seven states. They found high internal consistency overall ($\alpha = 0.96$) and by subscale ($\alpha = 0.87$ to $0.98$) and concurrent validity with the BoQ ($r = 0.64$, $p < .01$) and the PBIS Self-Assessment Survey (SAS; Center on PBIS, 2009; $r = 0.55$, $p < .01$) when completed with an external coach. The BoQ is a 53-item self-report fidelity tool completed by a PBIS team, in consultation with an external coach, designed to evaluate implementation of universal PBIS. Cohen et al. (2007) conducted the initial psychometric evaluation of the BoQ. They found high overall internal consistency ($\alpha = 0.96$), test-retest reliability ($r = 0.94$, $p < .01$), and interrater agreement (89%). Both the TFI and BoQ are scaled as a percentage of fidelity items met.

### 5.4. Data analysis

Prior to analyses, we examined fidelity of ISF implementation and found two of the eight schools (one from each site) randomly assigned to implement ISF and trained did not comply with implementation requirements. Specifically, these two schools did not meet ISF or PBIS implementation fidelity expectations (70%–80% of total points endorsed by instrument authors; Algozzine et al., 2019; Splett, Perales, et al., 2020) at any measurement point during the 2-year study. Final ISF-II scores in these two schools averaged 60% as compared to an average of 82.6% of total points for the other six schools assigned to the ISF condition. Final TFI or BOQ scores averaged 40.5% for these two schools as compared to 81.8% of total points for the other six ISF schools. These fidelity findings are

consistent with study documentation of school leadership in both low fidelity schools declining to implement core ISF procedures (e.g., regular and systematically conducted team meetings). Given these two schools did not fully participate or comply with implementation of their assigned condition, the limited number of schools randomized into the ISF condition to begin with, and that this study was the first to systematically and experimentally evaluate ISF effects, we removed those two schools from all analyses. Thus, this study used a treatment-on-the-treated (ToT) approach for all data analyses (see Rubin, 1974). However, we did estimate intent-to-treat (ITT) models for all distal outcomes. No differences in statistical significance between ToT and ITT results were found (full ITT results are available as Supplementary Materials). The only differences were effect sizes. The ITT effect sizes were slightly smaller in the ITT results as compared to the ToT results. We report ToT results in this study because this is the first experimental evaluation of ISF and we wanted to report the effects of ISF implemented as designed.

Proximal variables were examined using descriptive statistics and regression analyses. The unit of analysis for all proximal variables was school, therefore the sample size was 22 schools (eight PBIS only, eight PBIS+SMH, and six ISF). First, we examined the number of meetings as reported on the Team Meeting Form. Treatment group differences were evaluated using a Poisson regression model with treatment condition predicting the number of meetings. We did not include any school-level covariates due to the small sample size. We then used the estimated marginal means from the Poisson regression model to contrast the three treatment conditions using the *emmeans* package (Lenth, 2021) in R (R Core Team, 2017).

Next, we examined differences in the length of time each school held an ISF team meeting. First, we calculated the total number of minutes for each school team meeting for each day they met. Next, we examined the skewness of meeting time to evaluate the scaling and found positive skew (2.37). We transformed time to the log of time to better approximate normality, re-estimated skewness, and found skew for the log of time per meeting was close to zero (0.19). Then, we estimated a fixed-effects regression model for the 377 meetings in 2016–2017 and the 357 meetings in 2017–2018 with the log of time as the dependent variable and treatment group as the independent variable. We included a fixed-effect for school in both models as each team was not independent from the school where the meeting occurred (Stock & Watson, 2015). Given the sample size, we did not include school-level covariates beyond the school fixed effects, which included 22 schools and parameters in the model. We used a series of fixed-effects logistic regression models to compare (a) the likelihood a team discussed tiers of prevention and intervention between the treatment conditions and (b) the presence of a principal, school psychologist, and school counselor at a meeting. The models were the same as that used for meeting time, except that the dependent variable was dichotomous for all outcomes. Last, we calculated descriptive statistics and the percentage of students that received interventions by condition. We then used the Kruskal-Wallis rank sum test to compare the percentage of students receiving interventions by treatment condition and examine whether or not differences were statistically significant.

For distal variables, two different approaches were used to evaluate treatment effects. To evaluate the effect of ISF on distal outcomes after 1 year of ISF implementation (i.e., immediate post-test results), we used data from the 2015–2016 (pre-ISF), 2016–2017, and 2017–2018 (post-ISF) school years to estimate difference-in-difference (DiD) models. DiD is an econometric approach to estimating treatment effects controlling for initial heterogeneity between the groups (Dimick & Ryan, 2014). This approach was used because the three groups were not equivalent on the dependent variables prior to implementation of the interventions. The DiD estimator is calculated using a regression model, with time (i.e., pre and post intervention), treatment group, and a time-by-treatment group interaction. The DiD estimator (i.e., the time-by-treatment interaction) estimates the effect of ISF by comparing the changes in outcomes over time between those enrolled in ISF and a combined control group. For the DiD analyses, we combined the PBIS and PBIS+MH conditions to create the dichotomous treatment effect necessary for the DiD model. A random-effect by school was incorporated to adjust for student clustering within schools. All DiD models were estimated with R (R Core Team, 2017) using *lme4* (Bates et al., 2015).

In the DiD models, we used logistic regression for all dichotomous outcomes (e.g., OSS) and linear regression models for all other outcomes. Student-level covariates noted earlier (e.g., grade level, gender) were included. We also included school-level unexcused absences and either school-level ODR or OSS as covariates, depending on the outcome of interest. We included these school-level covariates to control for school-level behavior on individual student-level behavior.

We developed a series of generalized linear mixed models (GLMM) to estimate treatment effects for both the 2016–2017 and 2017–2018 treatment school years (i.e., effects after 2 years of implementation). In these models, we leveraged all 5 years of data (i.e., including the 3 years prior to treatment) and examined the likelihood a student received an ISS, OSS, and ODR from baseline to intervention and then differences by treatment condition. These models estimated treatment effects for both the 2016–2017 (1 year of ISF implementation) and 2017–2018 school years (2 years of ISF implementation). The modeling approach was similar to that used by Gage et al. (2017) to evaluate the average effect of PBIS on academic achievement. We created three-level GLMMs with students nested in schools and school years. All three dependent variables (i.e., ISS, OSS, and ODR) were dichotomous. Each model included the same student- and school-level covariates as those used in the DiD models. The DiD coefficient is an interaction term using two dichotomous variables: a time indicator with A dichotomous indicator for treatment phase was created to represent before (pre) and after (post) the research team began working with schools, 0 for pre and 1 for post. We then used interaction terms with the treatment phase (pre and post) and the treatment condition (PBIS, PBIS+SMH, and ISF) to evaluate differences in treatment effects by treatment condition from pre to post.

To test the hypothesis that ISF effects on disciplinary outcomes were stronger for African American students than White students, we then re-estimated each model and included a time (pre vs. post intervention) x treatment group (ISF vs. not ISF) x race/ethnicity (African American vs. not African American) interaction effect. The exploratory moderator analyses were included because data suggest African Americans are more likely to experience disciplinary actions (Gage et al., 2019). Thus, we wanted to explore if ISF significantly impacted these students. We included the three-way interaction effect in the GLMMs because the sample size was larger (more years of data) for these exploratory models. All GLMMs were estimated in the *lme4* (Bates et al., 2015) in R (R Core Team, 2017).

No variable had >3% missingness. Given minimal missingness (Jakobsen et al., 2017), complete case analysis was conducted.

## 6. Results

Following the ToT approach described above (see Rubin, 1974), the two non-implementing ISF schools were removed from all analyses, leaving six ISF schools and eight each in PBIS only and PBIS+SMH conditions.

### 6.1. Proximal variables

#### 6.1.1. Team functioning

Descriptive information regarding team functioning is provided in Table 2. First, we examined differences between treatment conditions for the number of team meetings held. Poisson regression models suggest that, at the end of the 2016–2017 school year, schools in the ISF condition held significantly more meetings than those in both the PBIS only condition ($b = 0.62$, $se = 0.14$, $p < .001$) and the PBIS+SMH condition ($b = 0.33$, $se = 0.13$, $p < .05$; coefficients are log scaled). Results for 2017–2018 suggest that schools in the ISF condition held significantly more meetings than schools in the PBIS only condition ($b = 0.82$, $se = 0.14$, $p < .001$), but there were no differences between the PBIS+SMH and ISF conditions ($b = 0.08$, $se = 0.12$, $p = .78$).

Next, we examined the length of each meeting in minutes. Although the mean total minutes was smallest for the ISF condition, the standard deviation was twice as large for the PBIS only condition, suggesting large variability between meeting times and schools. We estimated two fixed-effects models with the log of total meeting time as the dependent variable and treatment condition as the independent variable. We estimated one model for 2016–2017 and one for 2017–2018, with both including school fixed-effects. We found that team meetings in ISF schools were significantly longer than meetings in PBIS only schools during the 2016–2017 school year when using the log of time. No difference was found between ISF and PBIS+SMH. To clarify the discrepancy between the raw data and the model results, the mean log (total time), adjusted for school differences, was 3.9 for PBIS only, 4.0 for PBIS+SMH, and 4.5 for ISF. No differences were found during the 2017–2018 school year.

We then examined the likelihood of a meeting focused on each of the three tiers of prevention and intervention. Each meeting was coded as focusing on data from a specific tier. We found that meetings in ISF schools were significantly more likely to focus on Tier 1 during the 2016–2017 school year (OR = 5.5, $p < .05$). No differences were found for the 2017–2018 school year. Results for Tier 2 and Tier 3 suggest that there were no significant differences between conditions for both school years. We examined the likelihood a principal, school psychologist, or school counselor attended a meeting. No differences were found for principal attendance, but meetings in ISF schools were significantly more likely to have a school psychologist in attendance during both 2016–2017 and 2017–2018 (OR > 10, $p < .01$). Although the average meeting was more likely to have a school counselor in the ISF schools, the difference between conditions was not statistically significant.

#### 6.1.2. Intervention receipt

The Intervention Receipt Form data summarized access to treatment among experimental conditions for students receiving Tier 2 or 3 interventions. Descriptive information is summarized in Table 3. During 2016–2017, there were more interventions delivered in the PBIS+SMH schools, followed by ISF and then PBIS only. However, at the end of 2017–2018, there were more interventions delivered in ISF schools. Next, we calculated the number of students receiving intervention and the average number of interventions each student received in each condition. On average, there were more students in ISF schools than the other two conditions for both years; therefore, we calculated the percentage of students in each school receiving intervention to ensure accurate comparison across conditions. Overall, we found that the same percentage of students received intervention in PBIS+SMH and ISF in 2016–2017. By Year 2 (2017–2018), a larger percentage of students in the ISF condition received intervention than in the PBIS+SMH condition. However,

**Table 2**
Descriptive statistics for team meetings by condition.

| | Year 1 (2016–17) | | | Year 2 (2017–18) | | |
|---|---|---|---|---|---|---|
| Characteristic | PBIS only | PBIS+SMH | ISF | PBIS only | PBIS+SMH | ISF |
| # of PBIS Meetings | 83 | 111 | 116 | 77 | 141 | 131 |
| *M* | 10.4 | 13.9 | 19.3 | 9.62 | 20.1 | 21.8 |
| *SD* | 7.5 | 12.1 | 7.5 | 3.78 | 8.99 | 7.68 |
| Length of Meetings (min) | | | | | | |
| *M* | 78.9 | 79.5 | 76.4 | 73.3 | 63.3 | 68.7 |
| *SD* | 81.9 | 46.9 | 44.1 | 53.8 | 29.5 | 34.7 |
| Tier 1 (%) | 39.8 | 46.8 | 62.1 | 64.9 | 62.4 | 76.3 |
| Tier 2 (%) | 50.6 | 47.7 | 37.1 | 66.2 | 68.1 | 71.8 |
| Tier 3 (%) | 33.7 | 23.4 | 34.5 | 67.5 | 66.7 | 61.1 |
| Principal attended (%) | 54.2 | 38.7 | 54.3 | 55.8 | 60.3 | 64.1 |
| School Psychologist attended (%) | 49.4 | 54.1 | 88.8 | 59.7 | 53.9 | 86.3 |
| School Counselor attended (%) | 69.9 | 73.0 | 85.3 | 66.2 | 76.6 | 90.1 |

*Note.* PBIS = Positive Behavioral Interventions and Supports; SMH = School Mental Health; ISF = Interconnected Systems Framework.

**Table 3**
Descriptive statistics for intervention receipt by condition.

| | Year 1 (2016–17) | | | Year 2 (2017–18) | | |
|---|---|---|---|---|---|---|
| Characteristic | PBIS Only | PBIS+ SMH | ISF | PBIS Only | PBIS+ SMH | ISF |
| # of Schools | 8 | 8 | 6 | 8 | 8 | 6 |
| School Enrollment | | | | | | |
| *M* | 528 | 677 | 693 | 509 | 646 | 627 |
| *SD* | 270 | 134 | 136 | 240 | 154 | 77 |
| Total # of Interventions | 1816 | 3812 | 2385 | 1181 | 1803 | 2258 |
| Total # of Students Receiving Intervention | 265 | 604 | 410 | 246 | 317 | 399 |
| Average # Interventions per Student | | | | | | |
| *M* | 6.9 | 6.3 | 5.8 | 4.8 | 5.7 | 5.7 |
| *SD* | 6.5 | 4.8 | 3.7 | 3.3 | 3.2 | 3.9 |
| Percentage (%) of Students Receiving Intervention | | | | | | |
| *M* | 9.5 | 11.0 | 11.0 | 7.6 | 6.2 | 11.0 |
| *SD* | 9.0 | 11.0 | 5.6 | 4.5 | 4.8 | 4.0 |

*Note.* PBIS = Positive Behavioral Interventions and Supports; SMH = School Mental Health; ISF = Interconnected Systems Framework.

results from the Kruskal-Wallis test suggest that there were no statistically significant differences between the three treatment conditions.

Table 3 reports the total number of interventions by condition. As noted in the table, the number of total interventions conducted and total number of students fluctuated across conditions and years. Table 4 provides the percentage of interventions by provider and condition. During the first year, we found that special education teachers provided the most interventions in ISF schools, whereas school counselors and community-employed clinicians provided the most interventions in PBIS+SMH schools. During the second year, community-employed clinicians provided almost half of all interventions in ISF schools as compared to <3% in the other conditions.

### 6.2. Distal variables

#### 6.2.1. Difference-in-difference models for disciplinary actions

As reported in Table 5, we found statistically significant negative effects for the DiD estimator for ISS and ODR. The results suggest that, controlling for pre-intervention rates and all covariates, students were significantly less likely to receive an ISS and an ODR in ISF schools. The effect sizes, when converted to standardized mean difference (*d*), were − 0.61 and − 0.19 standard deviation units, respectively. However, there was a significant, positive difference-in-difference coefficient for OSS, suggesting that there was more OSS in ISF schools ($d = 0.30$). Note, we do not report results of all covariates here or in Table 5 for clarity of presentation, but full tables are available from authors upon request.

#### 6.2.2. Generalized linear mixed effects models

As reported in Table 6, the first model examined treatment effects on ISS. The odds ratio for treatment (pre-post) was statistically significant and indicates that the odds of an ISS significantly decreased after treatment began in all schools. The interaction effect for treatment and ISF was also statistically significant, suggesting that students were less likely to receive ISS in ISF schools as compared to PBIS only schools. The odds ratio for the ISF effect on ISS was 0.46, which is approximately a − 0.42 standard deviation (*d*) decrease using the conversion suggested by Sánchez-Meca et al. (2003). Next, we examined OSS and again found a significant and negative

**Table 4**
Percent of interventions by provider type by condition.

| | Year 1 (2016–17) | | | Year 2 (2017–18) | | |
|---|---|---|---|---|---|---|
| Provider | PBIS Only | PBIS+ SMH | ISF | PBIS Only | PBIS+ SMH | ISF |
| Administrator | 13.5 | 13.5 | 1.5 | 1.5 | 1.2 | 0.1 |
| School Counselor | 10.5 | 24.9 | 23.4 | 22.5 | 13.9 | 10.6 |
| School Psychologist | 0.4 | 0.7 | 0.5 | 2.4 | 0.0 | 0.0 |
| Social Worker | 0.0 | 3.7 | 0.0 | 0.0 | 1.5 | 0.0 |
| Teacher | 10.1 | 12.9 | 7.8 | 24.0 | 16.1 | 11.3 |
| Community Employed Mental Health Clinician | 2.4 | 6.4 | 18.7 | 1.5 | 5.3 | 44.5 |
| SPED Teacher | 28.4 | 16.9 | 34.2 | 23.5 | 24.5 | 18.2 |
| Community Employed Student Support Personnel | 29.8 | 13.3 | 13.9 | 13.7 | 35.6 | 11.0 |
| Other | 4.9 | 7.7 | 0.0 | 10.7 | 1.8 | 2.6 |

*Note.* PBIS = Positive Behavioral Interventions and Supports; SMH = School Mental Health; ISF = Interconnected Systems Framework; SPED = Special Education Status.

**Table 5**
Difference-in-difference models for disciplinary exclusions.

| Outcome | Predictor | log(OR) | OR | Std. error | *p* value |
|---|---|---|---|---|---|
| ISS | | | | | |
| | (Intercept) | −10.31 | < 0.001 | 3.84 | 0.007 |
| | ISF | −0.26 | 0.77 | 0.74 | 0.728 |
| | time | −0.21 | 0.81 | 0.09 | 0.017 |
| | DiD | −1.11 | 0.33 | 0.31 | < 0.001 |
| OSS | | | | | |
| | (Intercept) | −7.55 | < 0.001 | 1.21 | < 0.001 |
| | ISF | 0.08 | 1.09 | 0.26 | 0.749 |
| | time | −0.35 | 0.71 | 0.07 | < 0.001 |
| | DiD | 0.55 | 1.73 | 0.13 | < 0.001 |
| ODR | | | | | |
| | (Intercept) | −2.78 | 0.06 | 0.85 | 0.001 |
| | ISF | 0.01 | 1.01 | 0.21 | 0.948 |
| | time | −0.17 | 0.84 | 0.04 | < 0.001 |
| | DiD | −0.34 | 0.71 | 0.08 | < 0.001 |

*Note.* The difference-in-difference model used data from the 2015–2016 and 2016–2017 school years. All three models included all student-level and school-level covariates, an indicator for state and Positive Behavioral Interventions and Support implementation fidelity.
ISS = In-School Suspension; OSS = Out-of-School-Suspension; ODR = Office Discipline Referral; ISF = Interconnected Systems Framework; DiD = Difference in Difference.

effect for treatment, indicating a decrease in the likelihood a student received an OSS following implementation, however, there was no difference between treatment conditions. Last, we examined ODRs. Again, we found a significant treatment effect for ODR, but no significant differences between the three treatment conditions when compared individually. However, given the negative coefficient for ISF and the positive coefficient for PBIS+SMH for ODR, we re-estimated the model and compared ISF to a combined PBIS only and PBIS+SMH condition to compare ISF to all comparison schools. The combined model resulted in a significant, negative treatment effect and an odds ratio of 0.80 for ODR. When converted to standardized mean differences, the *d* was −0.12, suggesting that students in ISF were 0.12 standard deviation units less likely to receive an ODR relative to students in the other treatment conditions.

We then re-estimated the models with an interaction effect for African American students. The three-way interaction effect (pre/post x ISF x African American students) for African American students and ISS was not significant. However, the results for OSS were different. We found that African American students were significantly less likely to receive an OSS in an ISF school following the introduction of the treatment than African American students in comparison schools. When converted to standardized mean difference, we found an effect size of −0.31 standard deviation units. We also found a significant, negative three-way interaction effect for ODR, suggesting that African American students were also less likely to receive an ODR in ISF schools after implementation began. When converted to standardized mean difference, the effect size was −0.24 standard deviation units.

**Table 6**
Generalized linear mixed effects models estimating ISF treatment effects.

| | ISS | | | OSS | | | ODR | | |
|---|---|---|---|---|---|---|---|---|---|
| Predictors | Log(OR) | OR | *p* | Log(OR) | OR | *p* | Log(OR) | OR | *p* |
| Treatment (Pre-Post) | −1.56 | 0.21 | | −1.12 | 0.32 | | −0.37 | 0.69 | |
| | | | 0.93 | | | 0.037 | | | < 0.001 |
| PBIS+SMH | 0.71 | 2.04 | 0.342 | −0.01 | 0.99 | 0.445 | −0.19 | 0.82 | 0.376 |
| ISF | < 0.001 | 1 | 0.876 | 0.39 | 1.48 | 0.227 | −0.17 | 0.84 | 0.319 |
| Treatment: PBIS+SMH | 0.23 | 1.25 | | −0.11 | 0.9 | | 0.37 | 1.45 | |
| | | | 0.145 | | | 0.312 | | | < 0.001 |
| Treatment: ISF | −0.78 | 0.46 | | 0.18 | 1.19 | | −0.02 | 0.98 | |
| | | | 0.003 | | | 0.106 | | | 0.776 |
| Student Covariate | X | | | X | | | X | | |
| School Covariates | X | | | X | | | X | | |
| State | X | | | X | | | X | | |
| PBIS fidelity | X | | | X | | | X | | |

*Note.* PBIS only is the reference group. *n* = 62,573. Student covariates include grade-level, gender, race, and special education status. School covariates include enrollment, % male, % African American, % White, % Hispanic, % receiving special education services, number of unexcused absences, number of ODR for ISS and OSS models, and number of OSS for ODR model. PBIS = Positive Behavioral Interventions and Supports; SMH = School Mental Health; ISF = Interconnected Systems Framework; ISS = In-School Suspension; OSS = Out-of-School-Suspension; ODR = Office Discipline Referral.

## 7. Discussion

Implementation of the ISF has grown exponentially in recent years, with support from the Center on PBIS and various federal initiatives (e.g., School Climate Transformation grants funded by the Office of Elementary and Secondary Education; Advancing Wellness and Resiliency in Education grants, funded by the Substance Abuse and Mental Health Services Administration). The ISF is guided by a national workgroup that supports implementation in over 50 U.S. communities. However, in spite of this growth, the evidence base on the ISF has been limited, with the current study being the first randomized controlled trial experimentally examining its effects. In this study, we documented proximal benefits of the ISF, including more Tier 2 and Tier 3 interventions delivered, and a strong trend for more students receiving these interventions in ISF schools by the study's second year. In addition, the ISF emphasizes genuine education-mental health system partnerships (Weist et al., 2001), with formal memoranda of agreement for community mental health clinicians to be integrated into schools and functioning as if they were school employees (Barrett et al., 2013). It is striking that by the study's second year community clinicians were providing almost half of Tier 2 and 3 interventions in ISF schools, as compared to around 3% of interventions delivered in PBIS+SMH schools. This finding provides additional support for the recognition that without a structure for education-mental health system integration, as in the ISF, community clinicians will often come into schools and operate in a co-located manner, "seeing" a handful of students, but not participating on school teams, and generally not being integrated into the school delivery system (Eber et al., 2020; Splett et al., 2017; Weist et al., 2018).

Studies have indicated that improved screening procedures in SMH do in fact result in more students identified for services (Husky et al., 2011; Splett et al., 2018), with this study providing additional support for the critical importance of screening. However, screening alone may not be associated with enhanced services for students without effective team functioning (Iachini et al., 2013; Splett et al., 2017). ISF schools in the study met with more frequency than PBIS only ($d = 1.19$) and PBIS+SMH schools ($d = 0.52$), with more regular attendance from all SMH professionals assigned to the building (e.g., school psychologist). Notably, diversified team composition and organizational support that protects time and prioritizes the team's tasks are important factors associated with the effectiveness of teaming (Rosenfield et al., 2018). A critical strength of the ISF is its focus on effective and inclusive teams, actively using data, including screening data, for decision making, and proactively reaching out to students based on consistent assessment of their needs and functioning (Eber et al., 2020). These processes are of foundational importance in the current 2022 context with notable elevations in student need associated with the COVID-19 pandemic and major societal stressors (Leeb et al., 2020; Pier et al., 2021). Importantly, the DCLTs made concerted efforts to achieve sustainability of the ISF after the study ended. Although there was no official follow-up evaluation of ISF practices beyond the grant, researchers are aware of ongoing implementation efforts at both sites, corroborating evidence from the national work group that implementation is achievable without research grant support.

Notably, this study also documented important distal impacts on student outcomes, with ISF schools having fewer ODRs ($d = -0.19$) and ISSs ($d = -0.61$) than PBIS only and PBIS+SMH schools. These results are encouraging given data that PBIS reduces disciplinary actions when compared to schools not implementing PBIS (Lee & Gage, 2020). Thus, the results of this study suggest that schools implementing ISF reduce disciplinary exclusions even more than just PBIS alone. Subsequently, adding ISF decreases school-wide discipline outcomes, potentially increasing instructional time and creating a more positive school climate. We believe that the additive impacts of ISF on student discipline may be the result of better screening, data-based decision making, and awareness of mental health concerns for students. Although more research is needed to understand the mechanisms by which ISF impacts school-wide discipline data, these results are encouraging, particularly within the context of the positive effects PBIS alone can have on disciplinary exclusions.

Furthermore, there is evidence of equity enhancement of ISF, with African American students in these schools experiencing greater reductions in OSSs and ODRs relative to African American students in other schools. This is an important preliminary finding addressing the critical societal problem that African American students are more likely to experience exclusionary discipline (McNeill et al., 2016). Because exclusionary discipline increases risk for adverse outcomes and involvement in the juvenile justice system, the effect ISF has on reducing OSSs and ODRs also has the potential to reduce disparities for which African American students are at disproportionate risk (Kim et al., 2020).

### 7.1. Limitations

There are a few notable and related limitations to this study. First, our sample size of schools is fairly low, with eight schools each assigned to the three conditions of PBIS only, PBIS+SMH, or the ISF. Our selection of these three conditions was related to these three arrangements often seen in communities with whom we work. However, we acknowledge the choice of three versus two (e.g., PBIS+SMH vs. ISF) conditions may have added excessive complexity to the study and limited power (a newly funded RCT is comparing just these two conditions, see below). Others have written about the challenges of conducting RCTs of promising interventions in education research, including the expense and time of these trials, power analyses suggesting a number of schools that is not achievable, and simplistic, descriptive findings that do not contribute to theory (Connolly et al., 2018; Morrison, 2001). As it stands, with our current sample size, this trial involved more than $4 million in funding, underscoring limits in federal research grant mechanisms in relation to the optimal conduct of randomized controlled trials in schools.

Relatedly, two of our ISF schools did not implement the intervention as documented in fidelity data. As such, in major analyses, we moved away from the Intent-to-Treat (ITT) principle (Lachin, 2000) to include only truly implementing ISF schools. We believe this decision is justified because this was the first randomized controlled trial of the ISF, and if we had used the traditional ITT approach to analyses, promising effects of ISF, such as those related to intervention receipt, student discipline actions, and enhanced equity through reduced discipline for African American students would have resulted in smaller effect sizes. All ITT analyses conducted for this study

are available in the Supplementary Materials. Significant but attenuated effects observed in the ITT models as compared to the ToT models could indicate the presence of higher and lower impact implementation features associated with study outcomes. Rigorous systematic investigation of school characteristics, fidelity to specific implementation factors, and an array of meaningful outcomes would be beneficial for refining ISF uptake and implementation guidance for schools.

Third, there is always the risk of contamination in a study within school districts, especially given the increasing prominence of the ISF (see Eber et al., 2020; https://www.pbis.org/mental-health-social-emotional-well-being). To address this risk, leaders and staff from schools and collaborating mental health centers in the study made a verbal commitment to not share information with schools in another condition, the risk of contamination was discussed regularly in DCLT meetings, and research team members and district leaders regularly assessed what was happening in all schools' MTSS. Fourth, consistent with widely accepted research and evaluation practices, fidelity of PBIS implementation before and throughout the study was assessed by school district coaches, without involvement of the research team, so we acknowledge potential issues with the adequacy of these data. We also acknowledge we cannot guarantee our data collection procedures captured every team meeting or behavioral and mental health intervention. Finally, we noticed an increase in the number of team meetings reported across conditions, tiers, and sites from Year 1 to Year 2 and hypothesize this may be the result of assessment as intervention effects, as well as retraining on data collection procedures the district-employed, grant-funded program evaluation specialist and coach did with each study school at the beginning of Year 2 because of school administration and team member turnover.

### *7.2. Implications for future research and practice*

The ISF was developed to leverage strengths of two existing well-supported initiatives (i.e., school mental health and PBIS) and to address their respective weaknesses, thereby creating one systematized delivery system for tiered behavioral and mental health supports in school. As the first randomized controlled trial of ISF, the current study's results provide important guidance for future research and practice. First, in terms of practice, the study's results provide preliminary support for increasing adoption of the ISF and the availability of resources to support its implementation. The ISF was implemented in study schools via a multi-leveled structure of ongoing professional development, coaching, and technical assistance. Previous research and implementation experience suggest such supports are critical for installing and sustaining robust system change initiatives like PBIS and ISF (George et al., 2018). Thus, we strongly suggest schools, districts, and communities interested in installing the ISF should access implementation support from local, regional, and national resources, such as technical assistance providers (see www.pbis.org for contact information for regional and national providers) and implementation materials (e.g., Eber et al., 2020, available at www.pbis.org). Notably, many of the more recent implementation materials were informed by and developed from the successes and lessons learned of ISF implementation in the current study.

In terms of future research, further study of ISF effects on related proximal and distal outcomes is needed along with follow up studies to see how effects may be sustained for participating students and schools. Notably, the database from this study is very large with >31,000 student records. Additional analyses are underway, examining effects of ISF on outcomes of interest, including teacher and student reported school climate and student functioning. This study team has also obtained additional funding to replicate a randomized controlled trial on the ISF funded by the Institute of Education Sciences (B *Improving Social, Emotional, Behavioral, and Academic Functioning of Elementary School Students through the Interconnected Systems Framework*, #R324A210179; 2021–2025) involving 16 elementary schools with half assigned to PBIS+SMH and half assigned to ISF. The study will build from lessons learned from the trial reported on in this article, including expanded and improved stakeholder involvement and guidance to the study through a diverse District-Community Leadership Team, improved working relationships with principals focused on enhancing their buy-in and active leadership, and improving the measurement approach, particularly in relation to social, emotional, and behavioral screening of students (see Battal et al., 2020; Romer et al., 2020). In addition, we will enhance strategies for systematic team data-based decision making, and, along with enhanced screening, expect further improvements in student identification and receipt of Tier 2 and 3 interventions, as well as in equitable decision making and reduced discipline for all students and students of color. These strategies are consistent with recommendations for enhancing use of implementation science principles in SMH research; for example, better attending to and addressing relevant inner-setting characteristics (e.g., school policies, social networks, assessment practices; Owens et al., 2013).

## 8. Conclusion

The ISF provides a structure and process for improving and systematizing the delivery of a tiered continuum of behavioral and mental health supports in schools. The present study is the first to empirically examine its effects, filling a critical gap in the evidence base given the framework's recent increase in adoption and resources. Our findings suggest important and valuable effects of the ISF on proximal team functioning and intervention receipt outcomes and distal disciplinary outcomes, with additional impact on students of color. Thus, this study provides preliminary evidence of the promising effects of ISF supporting the need for further research and continuation of robust implementation efforts to best meet the behavioral and mental health needs of all students.

## Declarations of Competing Interest

None.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jsp.2022.08.002.

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